

## **BACT Analysis Application Instructions**

### **BEST AVAILABLE CONTROL TECHNOLOGY ANALYSIS FORMS**

- I ANALYSIS OF BEST AVAILABLE CONTROL TECHNOLOGY -- FORM BACT-01
- II BACKGROUND SEARCH - EXISTING BACT DETERMINATIONS -- FORM BACT-01a
- III COST/ECONOMIC IMPACT ANALYSIS -- FORM BACT-01b
- IV SUMMARY OF BEST AVAILABLE CONTROL TECHNOLOGY -- FORM BACT-02

### **I ANALYSIS OF BEST AVAILABLE CONTROL TECHNOLOGY -- FORM BACT-01**

Complete this form for each analysis of Best Available Control Technology (BACT). An individual BACT Analysis form should contain information regarding only one pollutant-facility combination; therefore, a facility with multiple pollutants subject to BACT would have multiple BACT Analysis forms for that facility. Refer to Chapter B of the U.S. EPA document entitled, "New Source Review (NSR) Workshop Manual" (Draft edition, October 1990) for detailed guidance on performing a BACT analysis. This manual is available at the following website: <http://www.epa.gov:80/rgytgrnj/programs/artd/air/nsr/nsrmemos/1990wman.pdf>.

*NOTE: The BACT analyses submitted by the applicant will be evaluated by the permitting authority. The final BACT determination will be made by the permitting authority based on the evaluation.*

#### **A. Facility Background:**

1. Source:  
Provide the name of the company or plant at which the affected facility is located.
2. Facility:  
Indicate the affected emission unit or process to which the BACT determination is applicable. The facility name should remain the same throughout all IDEM application forms.
3. Unit ID:  
Provide the identification number assigned to the facility. The unit ID for a facility should remain the same throughout all IDEM application forms.
4. Stack ID:  
Provide the identification number assigned to the stack. The stack ID for a facility should remain the same throughout all IDEM application forms.
5. Pollutant of Concern:  
Indicate the pollutant that triggered the BACT requirement. If there are multiple pollutants subject to a BACT requirement for a facility, a separate BACT analysis must be performed for each pollutant-facility combination.
6. Segment ID:  
Provide the segment identification assigned for the IDEM Plant Emissions

Inventory Forms required to be submitted for annual emissions reporting, if available. The segment ID for a facility should remain the same throughout all IDEM application forms.

7. SCC:  
Provide the Source Classification Code (SCC) for the facility or process.
8. Applicable Rule:  
Indicate which of the following three rules mandate the BACT analysis: 326 IAC 2-2 (Permit Review Rules: Prevention of Significant Deterioration (PSD) Requirements); 326 IAC 2-3 (Permit Review Rules: Emission Offset); and 326 IAC 8-1-6 (Volatile Organic Compound Rules: New Facilities; General Reduction Requirements).

**B. Facility Potential to Emit:**

Indicate the potential to emit (PTE, as defined in 326 IAC 1.1-1(16)) of each pollutant emitted from the affected facility or process. [Neither the total source PTE nor the total PTE for the entire permit should be specified in this table.]

**C. Summary of Existing BACT Determinations:**

1. Facility:  
Indicate the facility name from Section A.
2. Unit ID:  
Provide the identification number from Section A.
3. Pollutant:  
Indicate the pollutant of concern from Section A.
4. Provide the following summary information regarding the top existing BACT Determinations from five sources with a facility similar to your own. Note that the applicant should not limit the search to facilities identical to the proposed facility; the applicant should consider technology transfer applications as well. List these determinations in top-down order from the most to the least effective in terms of emission reduction potential/lowest emission rate (i.e., Source A should have the most stringent BACT Determination, and Source E should have the least stringent BACT Determination). The lowest emission rate refers to the "production-based" emission rate in which the emissions are given as the weight of pollutant emitted per production or input capacity of the unit (i.e., lb emitted/ton produced, lb emitted/MMBtu heat input, or lb emitted/lb raw materials used). In addition, complete FORM BACT-01a BACKGROUND SEARCH - EXISTING BACT DETERMINATIONS to provide more detailed information regarding each of the five determinations.

- a. **Source:**  
Provide the name of the company or plant at which the affected facility is located.
- b. **Affected Facility:**  
Indicate the affected emission unit or process to which the BACT determination is applicable.
- c. **BACT Determination:**  
Provide a brief description of the control requirements and/or limitations determined to be BACT for the affected facility. Include relevant details such as control/destruction efficiencies, capture efficiencies, and units. Include a separate attachment as necessary.
- d. **Reference:**  
Provide the sources of information used to obtain the BACT analysis information. Common references used include but are not limited to the U.S. EPA RACT, BACT, LAER Clearinghouse (RBLC), the South Coast Air Quality Management District (SCAQMD), and other federal, state, and local new source review permits.

**D. All BACT Options Considered:**

List all BACT options considered for the proposed facility, and identify which options are technically feasible. If an option is determined to be technically infeasible, specify the reason in the Comments/Rationale column. Do not list items determined to be infeasible later in Tables E, F, G, and H. Note that the available control options may include any technologies or techniques with a practical potential for application to the proposed facility and regulated pollutant under evaluation, including technologies employed outside of the United States that have been demonstrated in practice and/or innovative technologies. Note that the applicant is not required to examine innovative control technologies. Appendix A provides a list of examples of some of the control equipment technologies considered in BACT analyses submitted to IDEM, OAM.

1. **Facility:**  
Indicate the facility name from Section A.
2. **Unit ID:**  
Provide the identification number from Section A.
3. **Pollutant:**  
Indicate the pollutant of concern from Section A.
4. **BACT Option:**  
List the control equipment or emissions limitation options that will be considered in determining a BACT recommendation for the affected facility. At this point in the analysis, all possible options should be considered including but not limited to transferable technologies, inherently lower emitting processes, add-on controls, and combinations of inherently lower emitting processes and add-on controls.

5.      **Technically Feasible?:**  
            Indicate whether the options being considered are technically feasible for the affected facility.
6.      **Comments/Rationale:**  
            For each option indicated to be technically infeasible, provide a brief explanation in the space provided. Provide a more detailed explanation of the determination of technical infeasibility in a separate attachment to this form.

**E.      Ranking of Technically Feasible BACT Options:**

List all technically feasible BACT Options ranked in descending order of Overall System Pollution Reduction Efficiency. Use this same ranking order in Tables F, G, and H.

1.      **Facility:**  
            Indicate the facility name from Section A.
2.      **Unit ID:**  
            Provide the identification number from Section A.
3.      **Pollutant:**  
            Indicate the pollutant of concern from Section A.
4.      **Baseline Emissions Rate: (EMbase)**  
            Provide the estimated PTE in tons per year for the pollutant of concern from the affected facility before implementation of the BACT option.
5.      **BACT Option:**  
            List the technically feasible BACT options from Table D that will be considered in determining BACT for the affected facility.
6.      **Post-BACT Emissions Rate: (EMbact)**  
            Provide the projected PTE in tons per year for the pollutant of concern from the affected facility after implementation of each BACT option.
7.      **Emissions Reduction: (ER)**  
            Emissions reduction is the difference in PTE before and after BACT is implemented ( $ER = EM_{base} - EM_{bact}$ ). Provide the emissions reduction expected in tons per year based on the PTE before and after implementation of each BACT option.
8.      **Overall System Pollution Reduction Efficiency:**  
            The overall system pollution reduction efficiency (E) is a measure of the effectiveness of the BACT option calculated using the following equation:  
 $E(\%) = (ER / EM_{base}) * 100$ . Provide the overall system pollution reduction efficiency as a percent based on the PTE before and after implementation of each BACT option.

## F. Economic Analysis:

Provide the following information for each of the BACT options listed in Table E for which economic impacts are to be considered. FORM BACT-01b, COST/ECONOMIC IMPACT ANALYSIS must be completed for each BACT option listed in this table. Refer to the U.S. EPA document entitled, "Office of Air Quality Planning and Standards (OAQPS) Control Cost Manual" (5<sup>th</sup> edition, February 1996)\* for more detailed information on performing a BACT economic analysis. Note: If the applicant is recommending use of the top-ranked option in Table E, "Ranking of Technically Feasible BACT Options", it is not necessary to complete this portion of this form.

\*The most recent edition of the "OAQPS Control Cost Manual", as of the date these forms were published, is the February 1996 edition. The most current manual and escalation indices are available at the following website:

<http://www.epa.gov/ttn/catc/products.html#cccinfo> .

1. Facility:  
Indicate the facility name from Section A.
2. Unit ID:  
Provide the identification number from Section A.
3. Pollutant:  
Indicate the pollutant of concern from Section A.
4. BACT Option:  
List the BACT options from Table E in the same order.
5. Total Annualized Cost:  
Total Annualized Cost (TAC) is the sum of the annualized total capital investment and the total annual costs. Provide the TAC as calculated in Table H of FORM BACT-01b, COST/ECONOMIC IMPACT ANALYSIS for each BACT option.
6. Cost Effectiveness:  
Cost Effectiveness is the annualized cost associated with implementation of a BACT option in dollars per ton of pollutant emissions reduced.
  - a. Average: Average Cost Effectiveness (ACE) is the TAC for a BACT option divided by the emissions reduction for that BACT option (from Table E):  $ACE = TAC / ER$ . Provide the average cost effectiveness as calculated in Table I, item 4 of FORM BACT-01b, COST/ECONOMIC IMPACT ANALYSIS, for each of the BACT options.
  - b. Incremental: The incremental cost effectiveness (ICE) compares the TAC and post-BACT emission rate (i.e.,  $EM_{bact}$ ) of a BACT option (1) to that of the next most stringent option (2):  $ICE = (TAC_1 - TAC_2) / (EM_{bact1} - EM_{bact2})$ . Providing the ICE is optional and

may be used to justify the recommendation to eliminate a more stringent BACT option.

7. Comments/Rationale:

For each option determined to be economically infeasible, provide a brief explanation in the space provided. Provide a more detailed explanation of the determination of economic infeasibility in a separate attachment to this form.

**G. Environmental Impact Analysis:**

Environmental impacts of the BACT option consist of effects other than impacts on air quality standards due to emissions of the regulated pollutant in question (e.g., solid or hazardous waste generation, discharges of polluted water from a control device, visibility impacts, or emissions of other regulated or unregulated pollutants). Provide the following information regarding environmental impacts for each of the BACT Options listed in Table E.

1. Facility:  
Indicate the facility name from Section A.
2. Unit ID:  
Provide the identification number from Section A.
3. Pollutant:  
Indicate the pollutant of concern from Section A.
4. BACT Option:  
List the BACT options from Tables E and F in the same order.
5. Toxics Impact:  
Indicate by "Yes/No" whether air toxics or hazardous air pollutants, including those not regulated under the Clean Air Act, are generated or eliminated due to implementation of the BACT option. If "Yes" quantify the amount generated or eliminated per ton of pollutant controlled.
6. Adverse Impact:  
Indicate by "Yes/No" whether other adverse environmental impacts are generated or eliminated due to implementation of the BACT option. If Yes, quantify the amount of additional waste/emissions generated or eliminated per ton of pollutant controlled.

**H. Energy Impact Analysis:**

Energy impacts are the difference between the baseline total project energy requirements (without the BACT option being considered) and the projected total project energy requirements with the BACT option implemented. Provide the following information regarding the energy impacts of each BACT option listed in Table E.

1. Facility:  
Indicate the facility name from Section A.

2. Unit ID:  
Provide the identification number from Section A.
3. Pollutant:  
Indicate the pollutant of concern from Section A.
4. BACT Option:  
List the BACT options from Tables E, F, and G in the same order.
5. Baseline:  
Provide the energy requirements for the facility (prior to application of any BACT).
6. Incremental increase over baseline:  
For each BACT option, quantify any changes in energy requirements that could result from applying the BACT option. Use the same units of energy as for the baseline energy requirements.

**I. BACT Recommendation:**

1. Pollutant:  
Indicate the pollutant of concern from Section A.
2. Facility:  
Indicate the facility name from Section A.
3. Unit ID:  
Provide the identification number from Section A.
4. BACT Option Recommended:  
Indicate the control requirement or limitation option recommended as BACT for the affected facility.
5. Justification:  
If the top option was not selected, indicate why the more stringent BACT option(s) was (were) eliminated. Provide additional pages of explanation as necessary.

**J. Additional Forms/Attachments:**

1. FORM BACT-01a: BACKGROUND SEARCH - EXISTING BACT DETERMINATIONS:  
Indicate that a summary of the top five BACT determinations performed under the project is provided with this application. This form is mandatory whenever a BACT analysis is performed. Only one form needs to be completed per permit as long as all relevant information is provided. ***The BACT application is incomplete if this form is not submitted.***
2. FORM BACT-01b: COST/ECONOMIC IMPACT ANALYSIS:  
Indicate the number of Cost/Economic Analyses included as part of this BACT Analysis. This form is mandatory for each option in which costs and economic

impacts are to be considered. ***The BACT application is incomplete if any one of these forms are not submitted.***

3. FORM BACT-02: SUMMARY OF BEST AVAILABLE CONTROL TECHNOLOGY:  
Indicate that a summary of all BACT analyses performed under the project is provided with this application. This form is mandatory whenever a BACT analysis is performed. Only one form needs to be completed per permit as long as all relevant information is provided. ***The BACT application is incomplete if this form is not submitted.***
4. FORM PSD/EO-01: PSD/EMISSION OFFSET CHECKLIST:  
Indicate whether a PSD/Emission Offset Checklist is provided with this application. This form is mandatory for all applications with facilities subject to 326 IAC 2-2 (PSD Requirements) or 326 IAC 2-3 (Emission Offset). ***The application is incomplete if this form is not submitted (when required).***
5. ADDITIONAL ATTACHMENTS:  
Indicate the number of additional attachments included as part of this BACT analysis, and provide a listing of these supplemental documents along with the total number of pages of each in the space provided. Include the facility name, unit ID, and pollutant on each page of the attachments. ***The BACT application may be deemed incomplete if sufficient documentation is not submitted.***



## **II BACKGROUND SEARCH - EXISTING BACT DETERMINATIONS – FORM BACT-01a**

1. Facility:  
Indicate the facility name from FORM BACT-01, Section A.
2. Unit ID:  
Provide the identification number from FORM BACT-01, Section A.
3. Pollutant:  
Indicate the pollutant of concern from FORM BACT-01, Section A.

Provide the following information regarding the top BACT determinations from five sources with a facility similar to your own. Note that the applicant should not limit the search to facilities identical to the proposed facility; the applicant should consider technology transfer applications as well. List these determinations in top-down order from the most to the least effective in terms of emission reduction potential/lowest emission rate (i.e., Source A should have the most stringent BACT Determination, and Source E should have the least stringent BACT Determination). The lowest emission rate refers to the "production-based" emission rate in which the emissions are given as the weight of pollutant emitted per production or input capacity of the unit (i.e., lb emitted/ton produced, lb emitted/MMBtu heat input, or lb emitted/lb raw materials used).

### **A through E**

For each source, complete the following:

1. Source:  
Provide the name of the company or plant at which the affected facility is located.
2. City:  
Indicate the city in which this source is located.
3. State:  
Indicate the state in which this source is located.
4. Facility:  
Indicate the affected emission unit or process to which the BACT determination is applicable.
5. Capacity:  
Provide the appropriate capacity (e.g., raw material input, maximum production, or fuel usage rates, etc.), and specify the appropriate units for capacity.
6. Permit:  
Provide the identification number of the permit for the affected facility.
7. Date Issued:  
Provide the issuance date of the permit listed in 6.

8. **Regulatory Authority:**  
Indicate the regulatory citation mandating the BACT analysis. Examples include federal prevention of significant deterioration (PSD), federal non-attainment new source review (NSR), or a state rule cite such as 326 IAC 8-1-6.
9. **BACT Determination:**  
Provide the control requirements and/or limitations determined to be BACT for the affected facility. Include relevant details such as control/destruction efficiencies, capture efficiencies, and units. Include separate attachments as necessary.
10. **Baseline Emissions Rate (EMbase):**  
Provide the estimated PTE for the pollutant of concern from the affected facility before implementation of the BACT option (specify units).
11. **Post-BACT Emissions Rate (EMbact):**  
Provide the projected PTE for the pollutant of concern from the affected facility after implementation of the BACT option (specify units).
12. **Emissions Reduction Potential:**  
Provide the emissions reduction potential (P), which is a measure of the effectiveness of the BACT option calculated with the following equation:  
$$P(\%) = ((EM_{base} - EM_{bact}) / EM_{base}) * 100.$$
13. **Compliance Achieved?:**  
Indicate whether or not the affected facility has achieved compliance with the BACT determination requirements in practice/operation.
14. **Method of Compliance Demonstration:**  
If compliance was achieved, provide the method of compliance demonstration, such as a stack test, continuous emission monitoring system (CEMS) data, etc.
15. **Actions Taken for Non-compliance:**  
If compliance was not achieved initially, indicate any actions taken to bring the source into compliance, such as revising the BACT, process adjustments, etc.
16. **Cost Effectiveness:**  
Provide the overall cost effectiveness in dollars per ton of pollutant removed for the referenced BACT analysis.
17. **Reference:**  
Provide the sources of information used to obtain the BACT analysis information. Common references used include but are not limited to the U.S. EPA RACT, BACT, LAER Clearinghouse (RBLC), the South Coast Air Quality Management District (SCAQMD), and other federal, state, and local new source review permits.

Repeat steps 1 through 17 of Section A for Sources 2, 3, 4 & 5.

### III COST/ECONOMIC IMPACT ANALYSIS – FORM BACT-01b

Complete this form for each BACT option in which cost and economic impacts are to be considered. If the applicant is recommending the top option under the "Ranking of Technically Feasible BACT Options" section (Table E) of FORM BACT-01, it is not necessary to complete this form. Refer to the most recent edition of the United States Environmental Protection Agency (US EPA) document entitled, "Office of Air Quality Planning and Standards (OAQPS) Control Cost Manual" for additional guidance, definition of terms, and default values. Refer to the most recent edition of the US EPA document entitled, "Escalation Indices for Air Pollution Control Costs" for additional default values.

Identify the applicable costs in the "Item" columns, and specify the cost estimates in the "Cost Estimate" columns. Specify the references/sources of the cost estimates (i.e., vendor/contractor quotes (preferred), "OAQPS Control Cost Manual", etc.) in the "Reference/Source of the Cost Estimate" columns. Attach a copy of the cost estimate in a format such that IDEM, OAM staff can easily reproduce the cost estimates. On this form, do not include costs that would be incurred regardless of whether the BACT option is chosen. If the particular item is not applicable to the BACT option being evaluated, indicate "Not Applicable" (N/A) in the appropriate blanks, and provide an explanation in the "Comments/Explanation" box at the end of each section. Add additional lines and/or copy the forms as necessary.

**NOTE:** The most recent edition of the "OAQPS Control Cost Manual", as of the date these forms were published, is the February 1996 edition. The most current manual and escalation indices are available at the following website:  
<http://www.epa.gov/ttn/catc/products.html#cccinfo>.

#### Source Information

The Source Information table includes general facility and BACT option information so that the OAM permit reviewer can match and compare the cost/economic impact analysis to the proper BACT option in Form BACT-01.

1. Facility:  
Indicate the facility name from FORM BACT-01, Section A.
2. BACT Option:  
Indicate the BACT option from FORM BACT-01 to which this economic analysis applies.
3. Unit ID:  
Provide the identification number from FORM BACT-01, Section A.
4. Pollutant:  
Indicate the pollutant of concern from FORM BACT-01, Section A.

Repeat this information in the spaces provided at the top of each subsequent page.

## TOTAL CAPITAL INVESTMENT

Total Capital Investment (TCI) is the total direct and indirect capital costs associated with implementation of a BACT option. Use Tables A and B to indicate the direct and indirect capital costs that would be incurred above the baseline project costs. Summarize the total capital costs in Table C.

### A. Direct Capital Costs:

Direct capital costs include the purchased equipment costs and direct installation costs associated with implementation of a BACT option.

#### Purchased Equipment Costs

Purchased equipment costs include all costs that may be incurred from purchasing equipment required for implementation of the BACT option.

1.     Equipment Costs:  
        Provide an itemized list of the equipment required for the BACT option (e.g., incinerator, auxiliary equipment, fabric filter, bags, etc.). Include the costs for each piece of equipment listed.
2.     Instrumentation:  
        Indicate the cost of the instrumentation required to operate the BACT option equipment. If instrumentation was included in the purchased equipment cost, do not repeat those costs here. If a factor is used to calculate this cost based on the baseline equipment cost, the justification for using the factor must be given in the "Comments/Explanation" section at the end of Table A.
3.     Sales Tax:  
        Indicate the amount of sales tax that would be charged on the purchased equipment and instrumentation.
4.     Freight:  
        Indicate the cost associated with shipping the purchased equipment. If a factor is used to calculate this cost based on the baseline equipment cost, the justification for using the factor must be given in the "Comments/Explanation" section at the end of Table A.
5.     Other:  
        Identify and quantify any additional costs related to the direct purchase costs that will be incurred if this BACT option is chosen.
6.     Purchased Equipment Subtotal:  
        Sum the costs from Table A, items 1 through 5 above, and record the result in the "Cost Estimate" column of this line.

### **Direct Installation Costs**

Direct installation costs include the costs of labor and materials for installing equipment associated with implementation of a BACT option.

7.      **Foundations and Supports:**  
          Indicate the cost of foundations and supports that will be incurred if this BACT option is chosen.
8.      **Auxiliaries:**  
          Indicate the cost of installing auxiliary equipment such as duct work and fittings.
9.      **Handling and Erection:**  
          Indicate any special handling and/or erection costs that may be incurred due to need for special equipment to transport, unload, or place the equipment (e.g., "tight fit" in retrofit installations requiring special crane to lift equipment and place).
10.     **Piping:**  
          Indicate the amount and type of piping required and the cost estimate for the piping (e.g., 15 feet of 6-inch PVC piping).
11.     **Insulation and Painting:**  
          Indicate the cost associated with insulation and painting activities.
12.     **Electrical:**  
          Indicate the cost associated with electrical work.
13.     **Site Preparation:**  
          Indicate the cost associated with special site preparation activities.
14.     **Other:**  
          Identify and quantify any additional site specific direct installation activities that will be incurred if this BACT option is chosen.
15.     **Direct Installation Costs Subtotal:**  
          Sum the costs from Table A, items 7 through 14 above, and record the result in the "Cost Estimate" column of this line.
16.     **Direct Capital Costs Subtotal:**  
          Sum the costs from Table A, items 6 and 15, and record the result in the "Cost Estimate" column of this line.

**Comments/Explanation:**      Provide any additional comments or explanation necessary to assist the permit reviewer in evaluating the estimated costs.

### **B. Indirect Installation Costs:**

Indirect installation costs include the indirect costs for installing equipment associated with

implementation of the BACT option.

1.     **Engineering and Supervision:**  
        Provide cost estimates for the engineering and supervisory costs associated with the installation activities.
2.     **Lost Production:**  
        Provide cost estimates for lost production resulting from shutting down a process (if applicable) to complete the installation of the BACT option. In addition, provide an explanation of why the process must be shut down during production time to install the BACT option and why it is not possible to schedule it during planned down-time.
3.     **Construction and Field Expenses:**  
        Indicate the costs for construction and field expenses (i.e., costs for construction supervisory personnel, office personnel, rental of temporary offices, etc.).
4.     **Contractor Fees:**  
        Provide estimates of contractor fees (i.e., fees for construction and engineering firms involved in the installation).
5.     **Start-up and Performance Tests:**  
        Provide cost estimates of start-up and performance tests required to verify that the control system is properly installed and that it meets performance guarantees (if applicable).
6.     **Over-all Contingencies:**  
        Provide a cost estimate for over-all contingencies (e.g., project delays, increased expenses). Justify the estimate with an explanation of the value provided in the "Comments/Explanation" section at the end of Table B.
7.     **Working Capital:**  
        Provide a cost estimate for the working capital (e.g., initial costs of fuel, chemicals, other materials, labor, and maintenance) required during start-up of the BACT option equipment.
8.     **Other:**  
        Identify and quantify any additional site-specific, indirect installation costs that will be incurred if this option is chosen. Indicate the cost of each of these additional indirect capital expenditures.
9.     **Indirect Installation Costs Subtotal:**  
        Sum the costs from Table B, items 1 through 8 above, and record the result in the "Cost Estimate" column of this line.

**Comments/Explanation:**     Provide any additional comments or explanation necessary to assist the permit reviewer in evaluating the estimated costs.

**C. Capital Cost Summary:**

1. Total Capital Investment (TCI) Subtotal:  
Sum the costs from Table A, item 16, and Table B, item 9, and record the result on this line.
2. Capital Recovery Factor (CRF):  
Calculate the capital recovery factor (CRF) for the control system using the following equation:  $CRF = [i(1+i)^n] / [(1+i)^n - 1]$ , where "i" is the interest rate and "n" is the economic lifetime, explained in Chapter 2 of the "OAQPS Control Cost Manual".
  - a. Interest Rate:  
Specify the interest rate used to calculate the capital recovery factor. Justify the use of this interest rate value in the "Comments/Explanation" section at the end of Table C.
  - b. Economic Lifetime:  
Specify the economic lifetime in years of the BACT option used to calculate the capital recovery factor. Justify the use of this time period in the "Comments/Explanation" section at the end of Table C.
3. Capital Recovery Cost (CRC):  
CRC is the uniform end-of-year payment necessary to repay the TCI over the lifetime of the equipment at a set interest rate. Calculate the CRC in dollars per year (i.e., annualize the capital costs over the lifetime of the BACT option) using the following equation:  $CRC = CRF \cdot [TCI - (C_p + C_{pl})]$ .  $C_p$  and  $C_{pl}$  are the terms defined on page 2-25 of the "OAQPS Control Cost Manual" that account for the cost of those parts (including sales tax and freight) that would be replaced during the useful life of the control system and the labor for replacing them, respectively, such that the parts will not be double-counted in the total annualized costs. The "OAQPS Control Cost Manual" provides guidance on annualizing the capital costs in accordance with the equivalent uniform annualized cost method.

**Comments/Explanation:** Provide justification for the interest rate and economic lifetime used in order to assist the permit reviewer in evaluating the estimated costs.

**TOTAL ANNUAL COST**

Total Annual Cost includes the direct and indirect costs and recovery credits associated with implementation of a BACT option. Use Tables D and E to indicate the annual costs that would be incurred above the baseline project costs. Use Table F to indicate the recovery credits that would be realized after implementation of the BACT option. Summarize the total annual costs in Table G.

**D. Direct Annual Costs:**

Direct annual costs include the costs of the labor, materials, replacement parts, utilities, and waste treatment and disposal directly associated with implementation of a BACT option.

1.     **Operating Labor:**  
Itemize by job classification the operating labor costs required for the BACT option as the total working hours necessary per shift (e.g., two operators for three 8-hour shifts at \$20 per hour, one supervisor for one 8-hour shift at \$40 per hour, etc.).
2.     **Maintenance Labor:**  
Itemize by job classification the maintenance labor costs required for the BACT option as the total working hours necessary per shift (e.g., two maintenance personnel for two 8-hour shifts at \$20 per hour, one supervisor for one 8-hour shift at \$40 per hour, etc.).
3.     **Materials:**  
Identify and quantify the materials required annually for implementation of the BACT option (e.g., maintenance materials, chemicals required).
4.     **Utilities:**  
Identify the utility requirements for implementation of the BACT option (e.g., electricity, natural gas), and quantify the associated energy requirements and costs.
5.     **Waste Treatment and Disposal:**  
List the waste treatment and disposal requirements for implementation of the BACT option (e.g., absorber effluent, spent catalyst). Specify the quantities of waste materials to be treated or disposed and the respective costs.
6.     **Replacement Parts:**  
Identify the replacement parts required for implementation of the BACT option, and estimate the total annual costs for replacement parts.
7.     **Other:**  
Identify and quantify any other direct annual costs that will be incurred if this BACT option is chosen.
8.     **Direct Annual Costs Subtotal:**  
Sum the costs from Table D, items 1 through 7 above, and record the result in the "Cost Estimate" column of this line.

**Comments/Explanation:**     Provide any additional comments or explanation necessary to assist the permit reviewer in evaluating the estimated costs.



**E. Indirect Annual Costs:**

Indirect annual costs include the costs of the administrative requirements, taxes and other overhead incurred as a result of implementation of the BACT option.

1.     **Overhead:**  
          Indicate the annual cost of overhead (e.g., additional personnel for the administrative activities associated with the plant and payroll).
2.     **Property Taxes, Insurance, and Administrative Charges:**  
          Indicate the annual cost of property taxes, insurance and other administrative charges associated only with the BACT option.
3.     **Other:**  
          Identify and quantify any other indirect annual costs associated with the BACT option.
4.     **Indirect Annual Costs Subtotal:**  
          Sum the costs from Table E, items 1 through 3 above, and record the result in the "Cost Estimate" column of this line.

**Comments/Explanation:**     Provide any additional comments or explanation necessary to assist the permit reviewer in evaluating the estimated costs.

**F. Recovery Credits:**

Recovery credits include the credits and/or profits realized from the recovery of materials and/or energy as a result of implementation of the BACT option.

1.     **Materials Recovered:**  
          Indicate the annual credit due to materials recovered as a result of implementing this BACT option. Examples include but are not limited to credit for materials recovered by the control system that can be sold, recycled to the process, or reused elsewhere at the site minus costs for processing, storage, and transportation.
2.     **Energy Recovered:**  
          Indicate the annual credit due to energy recovered as a result of implementing this BACT option.
3.     **Other:**  
          Identify and quantify any other annual credits that would result from the implementation of the BACT option.
4.     **Recovery Credits Subtotal:**  
          Sum the credits from Table F, items 1 through 3 above, and record the result in the "Credit Estimate" column of this line.

**Comments/Explanation:** Provide any additional comments or explanation necessary to assist the permit reviewer in evaluating the estimated costs.

**G. Total Annual Cost Summary:**

1. Direct Annual Costs Subtotal:  
Record the value from Table D, item 8.
2. Indirect Annual Costs Subtotal:  
Record the value from Table E, item 4.
3. Recovery Credits Subtotal:  
Record the value from Table F, item 4.
4. Total Annual Cost Subtotal:  
The Total Annual Cost Subtotal is the sum of the direct and indirect annual cost subtotals in items 1 and 2, minus the recovery credits from item 3. Transfer this result to Table H, item 2.

**TOTAL ANNUALIZED COST SUMMARY**

Use Table H to sum the annualized costs associated with the BACT option. Use Table I to quantify the average cost effectiveness of the BACT option.

**H. Total Annualized Cost Summary:**

1. Capital Recovery Cost:  
Record the value from Table C, item 3.
2. Total Annual Cost Subtotal:  
Record the value from Table G, item 4.
3. Total Annualized Cost:  
Total Annualized Cost (TAC) is the sum of the Capital Recovery Cost and the Total Annual Cost Subtotal, item 1 plus item 2.

**I. Cost Effectiveness:**

Cost effectiveness is the annualized cost associated with implementation of the BACT option in dollars per ton of pollutant emissions reduced.

1. Baseline Emissions Rate (EMbase):  
Provide the estimated PTE in tons per year for the pollutant of concern from the affected facility before implementation of the BACT option.
2. Post-BACT Emissions Rate (EMbact):  
Provide the projected PTE in tons per year for the pollutant of concern from the affected facility after implementation of the BACT option.

3.      **Total Pollutant Removed:**  
          Subtract Table I, item 2, from Table I, item 1, and record the result on this line.
4.      **Average Cost Effectiveness:**  
          Divide the value in Table H, item 3 by Table I, item 3, and record the result on this line.

**Comments/Explanation:**      Provide any additional comments or explanation necessary to assist the permit reviewer in evaluating the estimated costs.

**Attachments:** In the space provided, list all supplemental documents submitted with this Cost/Economic Analysis along with the total number of pages in each. Include the facility name, unit ID, and pollutant on each page of the attachments. ***The BACT application may be deemed incomplete if sufficient documentation is not submitted.***

#### **IV SUMMARY OF BEST AVAILABLE CONTROL TECHNOLOGY -- FORM BACT-02**

##### **Facilities Subject to BACT:**

Complete this form for each proposed construction or modification project that is subject to one or more BACT analyses. Copy the form as necessary. FORM BACT-01, ANALYSIS OF BEST AVAILABLE CONTROL TECHNOLOGY, should be completed for each pollutant-facility combination listed in this table.

1. Facility Name:  
Provide each facility name from Section A of each FORM BACT-01 for the emission units or processes included in the project that are subject to a BACT analysis.
2. Unit ID:  
Provide each identification number from Section A of each FORM BACT-01.
3. Stack ID:  
Provide the identification number assigned to each stack from Section A of each FORM BACT-01.
4. Pollutants Subject to BACT:  
For each facility subject to BACT, indicate with an "x" or "T" whether a BACT analysis was performed for each of the criteria pollutants emitted from the facility. If a facility has multiple "other" pollutants, list them on separate lines, and skip a row before entering the information for the next facility.
5. Baseline Project Emissions Total:  
Indicate the estimated total baseline (before BACT) PTE for the criteria pollutants emitted from the project. If multiple "other" pollutants are emitted, provide the baseline PTE for these items as a separate attachment.
6. Post-BACT Project Emissions Total:  
Indicate the projected total Post-BACT (after all BACTs are considered) PTE for the criteria pollutants emitted from the project. If multiple "other" pollutants are emitted, provide the Post-BACT PTE for these items as a separate attachment.